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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/870,242
Filing Date: May 30, 2001
Appellant(s): GOELA ET AL.

John J. Piskorski
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 22, 2006 appealing from the Office action mailed October 7, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief (filed August 28, 2006 in response to the Notification of Non-Compliant Appeal Brief mailed July 28, 2006) is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,783,255	SUDA et al.	7-1998
5,443,649	SIBLEY	8-1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claims 27-29 and 32-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (USPN 5,783,255).

In regard to claims 27 and 32, Suda et al. teach a hollow chemical vapor deposited monolithic silicon carbide shell having an aspect ratio of 150 (col. 6, lines 33-35, col. 5, lines 22-25, col. 3, lines 55-67, col. 2, lines 16-18 and abstract). Suda et al. select a carbon substrate with a specific amount of graphite to control the thermal expansion coefficient of the substrate such that cracks are not formed in the silicon carbide shell upon removal of the substrate (col. 3, lines 13-30). The shaped article obtained is free from the generation of strain at a boundary between the SiC shell and the underlying substrate during the cooling process subsequent to the chemical vapor deposition treatment and has a dense and smooth surface (col. 4, lines 42-45).

While Suda et al. teach that the shell has a diameter of 5.9 inches (col. 6, lines 33-35, 150mm=5.9 inches), Suda et al. fail to explicitly teach that the external perimeter of the shell is 50 inches or greater (as claimed in claim 27) or in excess of 65 inches (as claimed in claim 32). Such a modification, however, would have involved a mere change in size. A change in size is generally recognized as being within the level of ordinary skill in the art in the absence of unexpected results (MPEP 2144.04 IV A). Since Suda et al. teach that the carbon substrate of Suda et al. is formed of a composite having a thermal expansion that is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling and that the thermal expansion coefficient of the carbon substrate is easily controlled

(col. 4, lines 15-23, col. 3, lines 20-25 and col. 2, lines 12-23), it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the shell of Suda et al. such that it has a particular external perimeter, depending on the particular desired end result, such as 50 inches or greater as claimed in claim 27, or in excess of 65 inches as claimed in claim 32, via control of the thermal expansion of the carbon substrate of Suda et al. such that the thermal expansion of the carbon substrate is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling as taught by Suda et al.

In regard to claim 28, Suda et al. teach that the shell has a cylindrical shape (col. 6, lines 33-55).

In regard to claim 29, Suda et al. teach that the shell has a frustoconical shape ("dome-shaped", col. 5, lines 22-25).

In regard to claim 33, while Suda et al. teach that the shell has an aspect ratio of 150 (col. 6, lines 33-35), Suda et al. fail to explicitly teach that the shell has an aspect ratio of 200 or greater. However, since Suda et al. teach that the carbon substrate of Suda et al. is formed of a composite having a thermal expansion that is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling and that the thermal expansion coefficient of the carbon substrate is easily controlled (col. 4, lines 15-23, col. 3, lines 20-25 and col. 2, lines 12-23), it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the shell of Suda et al. such that it has a particular aspect ratio, depending on the particular desired end result, such as 200 or greater as claimed, via control of the thermal expansion of the carbon substrate of Suda et al. such that the thermal

expansion of the carbon substrate is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling as taught by Suda et al.

In regard to claim 34, Suda et al. teach that the shell has an aspect ratio of 150 (col. 6, lines 33-35), which is greater than 100.

In regard to claim 35, Suda et al. teach a hollow chemical vapor deposited monolithic silicon carbide shell (col. 4, lines 39-48) having an aspect ratio of 150 (col. 6, lines 33-35) and as further discussed above in regard to claim 27. The method limitations recited in the third through eleventh lines of the claim have not been given patentable weight because these method limitations do not contribute any further structure or composition to that which is recited in the first through second or eleventh through thirteenth lines of the claim, and because the method of forming the shell is not germane to the issue of patentability of the shell itself. Nonetheless, Suda et al. teach providing a silicon carbide precursor gas in proximity to a surface of a solid substrate, subsequently providing a silicon carbide deposit on the surface of the substrate and subsequently removing the silicon carbide deposit (col. 3, lines 55-67 and col. 4, lines 23-27). Suda et al. teach that no cracking occurs during the formation of the article of Suda et al. (col. 4, lines 23-27), so cracks do not propagate during the formation of the article of Suda et al.

While Suda et al. teach that the shell has an external perimeter of 18.5 inches (col. 6, lines 33-35, 150mm=5.9inches, $5.9*\pi=18.5$), Suda et al. fail to explicitly teach that the external perimeter of the shell can be increased to 50 inches. Such a modification, however, would have involved a mere change in size. A change in size is generally recognized as being within the level of ordinary skill in the art in the absence of unexpected results (MPEP 2144.04 IV A). Since Suda et al. teach that the carbon substrate of Suda et al. is formed of a composite having a

thermal expansion that is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling and that the thermal expansion coefficient of the carbon substrate is easily controlled (col. 4, lines 15-23, col. 3, lines 20-25 and col. 2, lines 12-23), it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the shell of Suda et al. such that it has a particular external perimeter, depending on the particular desired end result, such as 50 inches as claimed, via control of the thermal expansion of the carbon substrate of Suda et al. such that the thermal expansion of the carbon substrate is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling as taught by Suda et al.

In regard to claim 36, Suda et al. teach the shell as discussed above in regard to claim 27. While Suda et al. teach that the shell has a diameter of 5.9inches (col. 6, lines 33-35, 150mm=5.9inches), Suda et al. fail to explicitly teach that the diameter of the shell can be increased to 18 inches or greater. Such a modification, however, would have involved a mere change in size. A change in size is generally recognized as being within the level of ordinary skill in the art in the absence of unexpected results (MPEP 2144.04 IV A). Since Suda et al. teach that the carbon substrate of Suda et al. is formed of a composite having a thermal expansion that is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling and that the thermal expansion coefficient of the carbon substrate is easily controlled (col. 4, lines 15-23, col. 3, lines 20-25 and col. 2, lines 12-23), it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the shell of Suda et al. such that it has a particular diameter, depending on the particular desired end result, such as 18 inches or greater as claimed, via control of the

thermal expansion of the carbon substrate of Suda et al. such that the thermal expansion of the carbon substrate is close to that of the silicon carbide film such that no cracking or deformation of the silicon carbide shell occurs during cooling as taught by Suda et al.

In regard to claim 37, Suda et al. teach the shell as discussed above in regard to claim 27 (claims 27 and 37 are identical except for the "and without propagating cracks" recitation at the end of claim 37). Suda et al. teach that no cracking occurs during the formation of the article of Suda et al. (col. 4, lines 18-23), so there are no cracks in the shell taught by Suda et al.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (USPN 5,783,255) in view of Sibley (USPN 5,443,649).

Suda et al. teach the shell as discussed above in regard to claim 27. While Suda et al. teach a dense silicon carbide (col. 4, lines 1-5), Suda et al. fail to explicitly teach that the density is at least 3.15 g/cc.

Sibley, however, teaches full density silicon carbide shells where the silicon carbide has a density of at least 3.18 g/cc (col. 8, lines 1-2). Sibley teaches the use of a full density silicon carbide for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process (abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided a full density silicon carbide material for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process as taught by Sibley. Therefore, it would have been obvious to one of ordinary skill in the art at

the time the invention was made to have modified Suda et al. to include full density silicon carbide in the silicon carbide shell in order to provide an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process as taught by Sibley.

(10) Response to Argument

Appellant's arguments presented on pages 9-12 of the Brief regarding the 35 U.S.C. 103 rejection of claim 27 over Suda et al. have been fully considered but are not persuasive.

Appellant argues that "[n]o where does Suda teach or even appear to suggest an external perimeter of 50 inches or greater as recited in present claim 1 [sic]", but since Suda et al. explicitly teach that crack formation in the SiC shell of Suda et al. is eliminated by the process used by Suda et al. to form the shell (col. 4, lines 18-23), one of skill in the art would have had reasonable expectation of success in fabricating a shell having an external perimeter that is larger than any of those explicitly taught in Suda et al. depending on the desired end result. The shell having a diameter of 5.9 inches (col. 6, lines 33-35, 150mm=5.9 inches) is merely exemplary, and is not taught by Suda et al. as a maximum diameter, so one of skill in the art would have had reasonable expectation of success in fabricating a shell having an external perimeter that is larger than any of those explicitly taught in Suda et al. depending on the desired end result.

Furthermore, since Suda et al. teach that the chemical vapor deposited shaped SiC article is useful for semiconductor articles (col. 7, lines 12-15), and since chemical vapor deposited shaped SiC articles are used as carriers ("boats") in the manufacture of semiconductor devices (as evidenced by col. 1, lines 11-22 of USPN 5,443,649 to Sibley), one of ordinary skill in the art

would have recognized to have increased the size of the article of Suda et al. over that of the explicitly disclosed exemplary sizes taught by Suda et al. in order to increase the size of semiconductor devices that the article of Suda et al. can hold, depending on the desired end result. MPEP 2144.04 IV A. Even furthermore, since Suda et al. teach the same method of forming the substrate as is claimed by Appellant (chemical vapor deposition), and since Suda et al. explicitly teach that crack formation in the SiC shell of Suda et al. is eliminated by the process used by Suda et al. to form the shell (col. 4, lines 18-23), one of skill in the art would expect that the chemical vapor deposition process of Appellant would also result in an SiC shell without crack formation.

Appellant argues that "Suda does not teach a 'cylindrical SiC shell' with a diameter of 150mm", but a "cylindrical" shell is not claimed in claim 27.

In the paragraph bridging pages 9 and 10 of the Brief, Appellant argues that "Examiner is only speculating that the articles disclosed in Suda may be increased in size to the size of the articles recited in present claim 1 [sic]", but the shell having a diameter of 5.9 inches (col. 6, lines 33-35, 150mm=5.9 inches) is merely exemplary, and is not taught by Suda et al. as a maximum diameter, so one of skill in the art would have had reasonable expectation of success in fabricating a shell having an external perimeter that is larger than any of those explicitly taught in Suda et al. depending on the desired end result.

Appellant argues that *In re Rose* is not applicable in the instant application, but *In re Rose* is applicable insofar as that case and the instant application involve a mere change in size of the claimed article over the prior art. Furthermore, MPEP 2144.04 IV A, which cites *In re Rose inter*

alia, is applicable since the application involves a mere change in size of the claimed article over the prior art.

Appellant argues that the probability of flaw formation is larger the larger the size of the article to be formed, but Appellant gives no evidence indicating whether or not the difference in the actual probability values between the size/s explicitly taught by Suda et al. and Appellant's claimed minimum size is sufficient for flaw formation to occur if the shell of Suda et al. of Appellant's claimed minimum size was formed.

On pages 10-12 of the Brief, Appellant discusses the Declaration under 37 C.F.R. 1.132 filed July 19, 2005 as support for Appellant's arguments that the shell of Suda et al. cannot be scaled to the sizes recited in the Appellant's claims. Appellant argues that "increasing the size of ceramic materials... during synthesis is not generally recognized as being within the level of ordinary skill in the art", "especially" when the volume of the shell is increased "by a factor of 2 or more". The "during synthesis" portion of this statement limits the applicability of this statement to increasing the size of the shell "during synthesis". The size of the shell of Suda et al. is not increased "during synthesis"- the shell is formed by deposition onto a substrate- so this argument does not apply to Suda et al. Appellant argues that the probability of flaw formation is larger the larger the size of the article to be formed, but Appellant gives no evidence indicating whether or not the difference in the actual probability values between the size/s explicitly taught by Suda et al. and Appellant's claimed minimum size is sufficient for flaw formation to occur if the shell of Suda et al. of Appellant's claimed minimum size was formed. Contrary to Appellant's assertion, Appellant has not "shown that it would not have been within the level of ordinary skill in the art to merely increase the size of a chemical vapor deposited silicon carbide

article without forming cracks or flaws" because Appellant has not provided evidence indicating whether or not the difference in the actual probability values between the size/s explicitly taught by Suda et al. and Appellant's claimed minimum size is sufficient for flaw formation to occur if the shell of Suda et al. of Appellant's claimed minimum size was formed.

Appellant's arguments presented on pages 12-13 of the Brief regarding the 35 U.S.C. 103 rejection of claim 28 have been fully considered but are not persuasive.

Examiner wishes to make it clear on the record that the Office has not stated on the record that the position of the Office is that "the claim limitations are 'probably satisfied' by Suda" as the language of the first paragraph under the "Claim 28" subheading suggests. Appellant's statement that "Examiner is only speculating that the claim limitations are "probably satisfied" by Suda" is misleading because it ascribes the phrase "probably satisfied" to the Office (particularly, the Examiner), while the phrase "probably satisfied" is not made of record by the Office in the prosecution history, and Applicant has not cited to the record where the phrase "probably satisfied" is purportedly made of record by the Office. In the paragraph bridging pages 9 and 10 of the Brief, the phrase "probably satisfied" is attributed to *In re Rijckaert*, but the language used by Appellant when repeatedly referring to the phrase "probably satisfied" in pages 12-20 of the Brief plainly (and incorrectly) ascribes the phrase "probably satisfied" to the Office (Appellant does so on each of the pages of the Brief numbered from 12 through 17, on page 19 and on page 20). Examiner stresses the point that Appellant plainly (and incorrectly) ascribes the phrase "probably satisfied" to the Office because Appellant repeatedly does so, and therefore, Appellant's basis for appeal appears to rest largely upon this incorrect characterization of the position of the Office.

Appellant's arguments regarding the rejection of claim 28 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Examiner again wishes to emphasize, in regard to Appellant's arguments regarding the rejections of ALL of the claims, that Appellant repeatedly, plainly and incorrectly ascribes the phrase "probably satisfied" to the Office on EACH of the pages of the Brief numbered from 12 through 17, on page 19 and on page 20. Examiner also wishes to point out that Appellant's basis for appeal appears to rest largely upon this incorrect characterization of the position of the Office.

Appellant's arguments presented on page 13 of the Brief regarding the 35 U.S.C. 103 rejection of claim 29 have been fully considered but are not persuasive. Appellant's arguments regarding the rejection of claim 29 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 13-14 of the Brief regarding the 35 U.S.C. 103 rejection of claim 32 have been fully considered but are not persuasive. Appellant's arguments regarding the rejection of claim 32 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 14-15 of the Brief regarding the 35 U.S.C. 103 rejection of claim 33 have been fully considered but are not persuasive. Appellant's arguments regarding the rejection of claim 33 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 15-16 of the Brief regarding the 35 U.S.C. 103 rejection of claim 34 have been fully considered but are not persuasive. Appellant's arguments

regarding the rejection of claim 34 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 16-17 of the Brief regarding the 35 U.S.C. 103 rejection of claim 30 over Suda et al. in view of Sibley have been fully considered but are not persuasive.

Regarding the 35 U.S.C. 103 rejection of claim 30 over Suda et al. in view of Sibley, Appellant's arguments are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 17-18 of the Brief regarding the 35 U.S.C. 103 rejection of claim 35 over Suda et al. have been fully considered but are not persuasive.

The method steps of claim 35 are not germane to the patentability of the claimed article. The structural limitations recited by the product by process claim have been treated, and are met by the rejection of record. The "bridge of deposit" Appellant mentions is not a component of the final product claimed by Appellant. Appellant argues that the "deposit may be removed from the deposition chamber without having to fracture the deposit, thus propagating cracks are prevented from forming in the deposit", but Suda et al. also teach that propagating cracks are prevented from forming in the deposit (so the structural limitations recited by the product by process claim are met by the rejection of record): Suda et al. explicitly teach that crack formation in the SiC shell of Suda et al. is eliminated by the process used by Suda et al. to form the shell (col. 4, lines 18-23). Weight has clearly been given to the recitation "without propagating cracks". See 35 U.S.C. 103 rejection of claim 35.

The remainder of Appellant's arguments regarding the rejection of claim 35 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant's arguments presented on pages 18-20 of the Brief regarding the 35 U.S.C. 103 rejection of claim 36 over Suda et al. have been fully considered but are not persuasive.

Appellant's arguments regarding the rejection of claim 36 are the same as Appellant's arguments regarding the rejection of claim 27, which have been addressed above.

Appellant argues that the probability of flaw formation is larger the larger the size of the article to be formed (and therefore Suda et al. teach away from the claimed size), but Appellant gives no evidence indicating whether or not the difference in the actual probability values between the size/s explicitly taught by Suda et al. and Appellant's claimed minimum size is sufficient for flaw formation to occur if the shell of Suda et al. of Appellant's claimed minimum size was formed. Likewise, Appellant has not shown that flaws would have been expected to form since Appellant has not shown evidence indicating whether or not the difference in the actual probability values between the size/s explicitly taught by Suda et al. and Appellant's claimed minimum size is sufficient for flaw formation to occur if the shell of Suda et al. of Appellant's claimed minimum size was formed.

Appellant's arguments regarding the rejection of claim 37 are the same as Appellant's arguments regarding the rejection of claim 36, which have been addressed above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Walter B. Aughenbaugh

November 9, 2006

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